



# PATENT COOPERATION TREATY

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From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

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## PCT

### NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing (day/month/year)	<b>28 JAN 2005</b>
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Applicant's or agent's file reference

1133/4

#### IMPORTANT NOTIFICATION

International application No.

PCT/IL03/00434

International filing date (day/month/year)

26 May 2003 (26.05.2003)

Priority date (day/month/year)

26 June 2002 (26.06.2002)

Applicant

R-JET ENGINEERING LTD.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US

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Ted Kim

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## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 1133/4	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IL03/00434	International filing date (day/month/year) 26 May 2003 (26.05.2003)	Priority date (day/month/year) 26 June 2002 (26.06.2002)
International Patent Classification (IPC) or national classification and IPC IPC(7): F02C 3/14, 3/34, 7/18 and US Cl.: 60/39.34, 39.35, 750, 806		
Applicant R-JET ENGINEERING LTD.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
  2. This REPORT consists of a total of 4 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:
  - ☒ Basis of the report
  - ☐ Priority
  - ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability
  - ☒ Lack of unity of invention
  - ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - ☐ Certain documents cited
  - ☐ Certain defects in the international application
  - ☐ Certain observations on the international application

Date of submission of the demand 21 January 2004 (21.01.2004)	Date of completion of this report 18 January 2005 (18.01.2005)
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer <i>Sharon M. Greene for</i> Ted Kim Telephone No. 703-308-0861

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/IL03/00434

## I. Basis of the report

1. With regard to the elements of the international application:\*

☐ the international application as originally filed.

☒ the description:

pages 1-23 as originally filed

pages NONE, filed with the demand

pages NONE, filed with the letter of \_\_\_\_\_.

☒ the claims:

pages NONE, as originally filed

pages NONE, as amended (together with any statement) under Article 19

pages NONE, filed with the demand

pages 24-27, filed with the letter of 01 June 2004 (01.06.2004)

☒ the drawings:

pages 1-12, as originally filed

pages NONE, filed with the demand

pages NONE, filed with the letter of \_\_\_\_\_.

☐ the sequence listing part of the description:

pages NONE, as originally filed

pages NONE, filed with the demand

pages NONE, filed with the letter of \_\_\_\_\_.

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages NONE

☐ the claims, Nos. NONE

☐ the drawings, sheets/fig NONE

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/IL03/00434

**IV. Lack of unity of invention**

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☒ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention is accordance with Rules 13.1, 13.2 and 13.3 is

- ☒ complied with.
- ☐ not complied with for the following reasons:

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☐ all parts.
- ☒ the parts relating to claims Nos. 1-10 (Group I)

**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. STATEMENT**

Novelty (N)	Claims <u>5 and 6</u>	YES
	Claims <u>1-4, 7-9</u>	NO
Inventive Step (IS)	Claims <u>5, 6</u>	YES
	Claims <u>1-4 and 7-9</u>	NO
Industrial Applicability (IA)	Claims <u>1-9</u>	YES
	Claims <u>NONE</u>	NO

**2. CITATIONS AND EXPLANATIONS**

Claims 1, 2, 9 lack an inventive step under PCT Article 33(3) as being obvious over Karlby et al (2,784,551). Karlby et al do not teach a substantially annular flame holder but teaches the flameholders may be of any suitable cross section (col. 6, lines 72+). As is well known in the flame holder art, annular cross sectional configurations are well known. It would have been obvious to one of ordinary skill in the art to employ an annular flame holder, as a well known cross section used in the art.

Claims 1, 2, 7-9 lack novelty under PCT Article 33(2) as being anticipated by Guirguis (4,897,995). Guirguis teach a rotating assembly with primary compressor 4a, inner casing (bottom of step of 5) and compressor driving turbine nozzle wheel 6; an outer casing 5c, a combustion chamber 5a defined between the with primary compressor, inner casing, compressor driving turbine nozzle wheel and outer casing, a substantially annular flame holder is the bluff portion of 5 surrounding the bottom of the step of 5.

Claims 1-4, 9 lack novelty under PCT Article 33(2) as being anticipated by Levesque (4,368,619). Levesque teaches teach a rotating assembly with primary compressor 28, inner casing 66 and compressor driving turbine nozzle wheel 113; an outer casing 10, a combustion chamber 88 defined between the primary compressor, inner casing, compressor driving turbine nozzle wheel 113 and outer casing, a substantially annular flame holder -- either 60 or 88 can be considered part of the flame holder as the flame is inherently held in both stages of the combustor.

Claims 5, 6 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest the tubular element dividing the compressor airflow.

Claims 1-9 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

----- NEW CITATIONS -----

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## WHAT IS CLAIMED IS:

1. An engine, comprising:
  - a. a rotating assembly including a primary compressor, an inner casing and a compressor-driving nozzle wheel;
  - b. an outer casing, enclosing said rotating assembly; and
  - c. a substantially annular flame holder encircling said inner casing within said combustion chamber;so that at least one combustion chamber is defined in the space between said primary compressor, said inner casing, said compressor-driving nozzle wheel and said outer casing, characterized in that said outer casing does not rotate with said rotating assembly.
2. The engine of claim 1, wherein said at least one combustion chamber is substantially a single annular combustion chamber.
3. The engine of claim 1, wherein said rotating assembly includes a single said flame holder.
4. The engine of claim 1, wherein said flame holder is included in said rotating assembly.
5. The engine of claim 1, further comprising:
  - c. a substantially tubular element surrounding said inner casing, wherein a leading edge of said tubular element is positioned aft of said primary compressor so as to divide airflow from said primary compressor into an outer airflow and an inner airflow, wherein said outer airflow is between said tubular element and said outer casing and wherein said inner airflow is between said tubular element and said inner casing
6. The engine of claim 5 wherein through said substantially tubular element are perforations allowing communication between said inner airflow and said outer airflow.

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7. The engine of claim 1 further comprising:  
c. a rotating diffuser between said primary compressor and said combustion chamber.
8. The engine of claim 7 wherein said rotating diffuser includes extensions to terminal blades of said primary compressor.
9. The engine of claim 1 wherein said rotating assembly further includes at least one fuel injector.
10. An engine comprising:  
a. a combustion chamber having an axis; and  
b. a combustion chamber compressor, coaxial with and radially inwards from said combustion chamber configured to counteract axial backflow in said combustion chamber.
11. The engine of claim 10 wherein said combustion chamber compressor includes:  
c. at least two combustion chamber compressor blades arrayed about said axis of said combustion chamber in at least one circle; and  
d. a substantially tubular combustion chamber compressor body encasing said combustion chamber compressor blades.
12. The engine of claim 10 further comprising:  
c. a rotating combustion chamber inner casing coaxial with said combustion chamber;  
d. at least two combustion chamber compressor blades rigidly attached to said rotating combustion chamber inner casing and arrayed about said axis of said combustion chamber in at least one circle; and  
e. a substantially tubular combustion chamber compressor body encasing said combustion chamber compressor blades.
13. In an engine having a combustion chamber wherein a mixture of fuel and air is burned, a method of reducing NO<sub>x</sub> emissions comprising:  
a. making a combustible mixture by combining exhaust, fuel and air in a first region of the engine;  
b. establishing an airflow vortex, within the combustion chamber, that creates a higher static pressure in a second region of the engine than in said first region of the engine; and

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c. burning said combustible mixture in the combustion chamber;  
wherein said exhaust is taken from said second region of the engine by said higher static pressure in said second region.

14. A method of cooling a blade of a bladed rotating wheel attached to the terminal end of a rotating axis through a blade base, comprising:

- a. providing at least one substantially annular axial channel rotating with the rotating axis, said at least one channel having an inlet and an outlet;
- b. feeding a cooling fluid into said at least one channel through said inlet; and
- c. directing cooling fluid emerging from said channel through said outlet at an outer surface of the blade base.

15. The method of claim 14 further comprising:

- d. increasing the pressure of said cooling fluid emerging through said outlet using a pressure-increasing device positioned inside said at least one channel.

16. The method of claim 14 wherein said bladed rotating wheel is a nozzle wheel and wherein said blade is a nozzle wheel blade.

17. The method of claim 14 wherein said bladed rotating wheel is a turbine wheel and wherein said blade is a turbine blade.

18. An engine, comprising:

- a. a rotating assembly including a primary compressor, an inner casing and a compressor-driving nozzle wheel;
- b. an outer casing, enclosing said rotating assembly; and
- c. a combustion chamber compressor in said combustion chamber;

so that at least one combustion chamber is defined in the space between said primary compressor, said inner casing, said compressor-driving nozzle wheel and said outer casing, characterized in that said outer casing does not rotate with said rotating assembly;

19. The engine of claim 18, wherein said combustion chamber compressor comprises a plurality of combustion chamber compressor blades attached to said inner casing.

20. An engine, comprising:

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a. a rotating assembly including a primary compressor, an inner casing and a compressor-driving nozzle wheel; and  
b. an outer casing, enclosing said rotating assembly;  
so that at least one combustion chamber is defined in the space between said primary compressor, said inner casing, said compressor-driving nozzle wheel and said outer casing, said compressor-driving nozzle wheel including a plurality of blades that define between them a corresponding plurality of nozzles, each said nozzle having a convergent-divergent shape.

21. An engine, comprising:

a. a rotating assembly including a primary compressor, an inner casing and a compressor-driving nozzle wheel; and  
b. an outer casing, enclosing said rotating assembly;  
so that at least one combustion chamber is defined in the space between said primary compressor, said inner casing, said compressor-driving nozzle wheel and said outer casing, the engine further comprising:  
c. a free nozzle wheel aft of said compressor-driving nozzle wheel;  
and wherein the engine lacks stator guide vanes between said nozzle wheels.

22. The engine of claim 21, wherein said free nozzle wheel includes a plurality of blades that define between them a corresponding plurality of nozzles, said blades being positioned so that gas jets that emerge from said nozzles emerge at an angle of at least about 82 degrees from parallel with a rotational axis of said rotating assembly.

23. An engine, comprising:

a. a rotating assembly including a primary compressor, an inner casing and a compressor-driving nozzle wheel; and  
b. an outer casing, enclosing said rotating assembly;  
so that at least one combustion chamber is defined in the space between said primary compressor, said inner casing, said compressor-driven nozzle wheel and said outer casing, wherein at least one of said primary compressor and said nozzle wheel is partly blocked.

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